Follow-up to recommendations *Takeoff with erroneous takeoff data, Boeing 737-800*

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1. About the report

A Boeing 737-800 was scheduled for a passenger flight from Amsterdam Airport Schiphol in the Netherlands to Munich Airport in Germany on 10 June 2018. The pilots of the Boeing 737 calculated their take-off parameters on the basis of the assumption that they would take off from Runway 09 at Intersection N5. Following a request from Air Traffic Control (ATC) the take-off position was subsequently changed to Intersection N4, reducing the available take-off distance. Just before the aircraft lined up on the runway, a crew member calculated the new take-off data. The investigation revealed that only new wind data were entered into the Flight Management Computer (FMC) whereas the intersection remained N5 instead of N4. The newly entered takeoff data were not checked by the other crew members. Because the new calculated and entered data were not checked, the computation of the takeoff parameters was based on an available runway length that was 3,494 metres instead of the actual 2,460 metres. The Boeing 737 then took off from Runway 09 at Intersection N4. The aircraft was rotated at the calculated rotation speed and became airborne 176 metres before the end of the runway.

Accidents and serious incidents as a result of the use of erroneous takeoff data take place regularly. Despite ongoing developments, there are currently no technical solutions that fully prevent the use of erroneous takeoff data. Therefore, operational solutions remain important to reduce the risk of using erroneous takeoff data. The Board issued two recommendations to stimulate the European Union Aviation Safety Agency (EASA) and KLM to promote and implement operational solutions. The Board specifically recommended to stop the aircraft in case of a last minute change to allow the crew more time to independently check and enter the changed takeoff data. This stationary moment should be considered as one of the key practices against preventing erroneous takeoff data entry.

This document contains a general conclusion, followed by a summary of the received responses to each recommendation and a conclusion on the recommendation’s follow up.

2. General conclusion about the follow-up

When assessing the follow-up to recommendations from aviation reports, the Board uses the classification and assessment criteria developed by the European Network of Civil Aviation Safety Authorities (ENCASIA) (see Appendix 1).

Based on the responses received from the parties, the Board concludes that EASA and KLM made efforts to mitigate the risk of erroneous takeoff data, but did not fully follow-up on the recommendations of the Board. The follow-up on both recommendations is **partially**

adequate. EASA and KLM did not fully implement the recommendation that pilots should allow for a stationary moment when calculating, checking and entering takeoff performance data in case of last minute changes. Furthermore, at KLM there is no adequate follow-up on the recommendation to encourage the use of full thrust for when last minute changes occur. Since taking off with erroneous takeoff data is a long standing and complex problem, and there are still no technical solutions that completely prevent erroneous takeoffs, it is important to take other (operational) measures to mitigate this risk. Therefore the Board calls on EASA and KLM to push forward with the follow-up on these recommendations.

3. Follow-up per recommendation

Recommendation 1

To the European Union Aviation Safety Agency (EASA):

> To recommend to operators and their flight crews to allow for a stationary moment when calculating, checking and entering takeoff performance data in case of last minute changes and implement this advice as recommended practice in guidance material, Safety Information Bulletin 2016-02R1 and other safety promotion material.

Response of EASA
EASA states that before implementing the recommendation, it wants to fully consider any associated additional hazards that the implementation of this recommendation might generate. Therefore EASA added the proposal in this recommendation to the ongoing work on the “Best Intervention Strategy” (BIS) for “Erroneous take-off Parameters” under SI-0015 “Entry of aircraft performance data” in the Commercial Air Transport (Aeroplanes) Safety Risk Portfolio.

EASA also states that it published an article entitled “Erroneous Take-Off Performance Data” which includes a video to raise awareness about the risk of erroneous data entry, in addition to the actions taken by EASA as described in the report of the Board. The video outlines five key practices that flight crews are recommended to follow to reduce the likelihood of entering erroneous take-off data. The first key practice is specifically mentioned by EASA: “Give yourself enough time to perform calculations and enter data into the Flight Management System; beware of distractions”. According to EASA, one way to achieve this is to make sure the aircraft is stationary when performing the calculations.[1]

Conclusion on the follow-up

[1] This is not mentioned in the article or the video though.

The Board recognises the safety promotion material available on the topic of erroneous takeoff data entry. Additionally, it supports that this recommendation is added to the ongoing work on the “Best Intervention Strategy” (BIS) for “Erroneous take-off Parameters”. However, the Board also notes that this BIS is in the programming phase and that EASA has not mentioned a delivery date in their reply as to when safety actions can be expected. It is important that the ongoing work on this BIS will be finished in short notice, because it is necessary to take additional measures to mitigate this risk. Because the follow-up on this recommendation is still part of ongoing work and the final outcome is to be awaited, the follow-up to the recommendation is classified, in accordance with the European classification, as **partially adequate**.

Recommendation 2

To KLM Royal Dutch Airlines:

To implement the following measures to prevent crews from taking off with incorrect takeoff data:

- Calculate, check and enter changed takeoff performance data only when the aircraft is stationary.
- Develop a procedure to have flight crews prepare an alternative plan in advance and encourage the use of full thrust for when last minute changes occur.
- Train flight crews to take action if they suspect that the takeoff roll does not develop as expected; make this training an element of the recurrent training program.

Response of KLM Royal Dutch Airlines
KLM describes the actions it took in order to reduce the risk of a recurrence of a similar incident. Thereafter KLM describes the follow-up on the different parts of this recommendation.

Concerning the first part of the recommendation, KLM responds that it will make adjustments to the Operations Manual (OM) part (A) BOM in order to include stopping the aircraft to calculate, check and enter changed takeoff performance data as ‘best practice’. In the response letter KLM states these changes in the OM would be implemented three months after the date of the letter. The updates to the manual were confirmed to the Board in an update on the response provided by KLM.

Concerning the second part of the recommendation, KLM states that it would like to study the effects of using full thrust when last minute changes occur before implementing this as standard practice. KLM considers this necessary because according to them, the formulation of the recommendation leaves no room for situation-specific nuance. Furthermore,

potentially negative effects have not yet been assessed fully. KLM says it is clear that negative effects are present, especially for takeoff routes with a low initial level-off altitude, high traffic density and/or a low aircraft weight. When the Board recently asked KLM about the current status of the study, he learned that KLM abandoned this study. According to KLM, the aircraft manufacturer issued a directive that one should avoid full thrust at a low gross aircraft weight.

In reaction to the third part of the recommendation, KLM states that the training of flight crews to take action if they suspect that the takeoff roll does not develop as expected is already part of the KLM recurrent training via the ATQP[2]-programme.

Conclusion on the follow-up
Although KLM added the best practice to stop taxiing in order to recalculate in case of last minute changes to the OM, it did not become mandatory to stop the aircraft as recommended by the Board. Therefore, the first part of the recommendation has not been adequately followed up.

The second part of the recommendation has not been followed up, because KLM did not develop a procedure to have flight crews prepare an alternative plan in advance or encourage the use of full thrust for when last minute changes occur. The reason not to encourage the use of full thrust when last minute changes occur is that according to KLM the aircraft manufacturer issued a directive that one should avoid full thrust at a low gross aircraft weight. The Board notes that the directive states something different, namely that one should use reduced thrust in situations where a low altitude level off is accomplished following a takeoff with a low gross aircraft weight. Furthermore, there are numerous situations in which the use of full thrust is encouraged. Full thrust is generally selected when weather conditions (i.e. cross wind above a specific limit, reported windshear, specific precipitation), aircraft systems (i.e. inoperative antiskid or thrust reversers) or aerodrome characteristics (i.e. short runway, high altitude aerodrome, obstacles) may adversely affect performance. Therefore, according to the Board, KLM's reasoning to discontinue the study into the effects of using full thrust is invalid. Since the use of full thrust when last minute changes occur is an important solution to the long standing and persistent risk of using erroneous takeoff data, the Board urges KLM to restart the study into the effects of using full thrust when last minute changes occur.

The third part of the recommendation is adequately followed-up by KLM, since the training of flight crews to take action if they suspect that the takeoff roll does not develop as expected is part of the KLM recurrent training via the ATQP-programme.

[2] Alternative training and qualification programme

All in all, the follow-up to the recommendation is, in accordance with the European classification, classified as **partially adequate**.

Appendix 1. Assessment criteria for aviation

In assessing responses to recommendations made to the aviation sector, the Safety Board uses the guideline issued by ENCASIA on the EU Regulation on the Investigation and Prevention of Accidents and Incidents in Civil Aviation (Regulation (EU) No 996/2010). ENCASIA is the European Network of Civil Aviation Safety Investigation Authorities. The classifications and associated assessment criteria are as follows:

Category	Guidance
Adequate	The response clearly shows that the safety issue identified by the recommendation has been addressed. The response shows that there is a high probability the action will be taken in the future to address the safety issue or intent. The response may not meet the intent of the recommendation as written but does address the underlying safety issue or has been superseded by other evidence/action.
Partially adequate	The response goes some way to addressing the intent of the recommendation or safety issue in that some action is taking place, but there is: • a likelihood the action may not take place, or • little or no likelihood of any further action by the addressee.
Not adequate	The recommendation response did not address the intent or safety issue, or the recommendation was rejected by the addressee and is not likely to be acted upon by them.
Awaiting response	Awaiting the first response from the addressee.
Superseded	The safety recommendation has been superseded.